RESEARCH INTERESTS SEBASTIAN ZWICKNAGL

0.1. **Overview.** I am currently interested in the connections between cluster algebras, representation theory on the one hand side and Poisson geometry and quantum groups on the other. I recently proved that if a cluster algebra $\mathfrak{A}$ is Noetherian (and its complexified version the ring of functions on an affine complex variety X) and $\{\cdot,\cdot\}$ a compatible Poisson structure on X, then X can be stratified into finitely many torus orbits of symplectic leaves. This stratification is indeed independent of the choice of compatible Poisson structure. Many known examples e.g. Grassmannians and nilpotent Lie algebras U_w fall into this pattern.

0.2. **Questions.** However, I would now like to understand whether there are related structures in the realm of monoidal or additive categorifications of cluster algebras. For example what sub-or quotient categories of representations of preprojective algebras correspond to these ideals. Or are there related structures in the twisted/motivic Hall algebras. I care about these structures for the following reasons.

0.3. **Some Background, results and conjectures.** The stratification introduced above can be described entirely using data from the exchange matrix of the initial cluster. I can show that we can use this data to classify all the symplectic leaves on such a variety X. Here, of course the stratification will depend on the Poisson structure. This description applies methods from the theory of quantum groups and non-commutative ring theory (Goodearl-Letzter stratifications) in the classical limit of Poisson structures. I would like to note that the Poisson version of Goodearl-Letzter stratifications was studied in a much more general context by Goodearl and coauthors. However, this approach does not directly yield an explicit description of these ideals in terms of generators and relations.

But these results provide a new approach the following rather old conjecture in the theory of quantum groups, resp. quantized function algebras: There exists a homeomorphism between primitive ideals in quantized function algebras and the symplectic leaves in the respective semiclassical limits. One should check Milen Yakimov's recent work "On the spectra of Quantum Groups" for more results and references. Among these algebras are quantum Grassmannians, quantum groups $\mathcal{O}_q(G)$ for G semisimple, and DeConcini-Kac-Procesi algebras U_w^q. These algebras have a natural quantum cluster algebra structure due to Geiß, Leclerc and Schröer. We have the following natural conjecture which I am able to prove for all acyclic quantum cluster algebras.

Conjecture 0.1. *Let $\mathfrak{A}_q$ be a quantum cluster algebra defined by a quantum seed $(\mathbf{x}, B, \Lambda)$, $\mathfrak{A}$ a cluster algebra given by a seed $(\mathbf{x}, B)$ and let Λ define a Poisson bracket on $\mathfrak{A}$. Then the primitive spectrum is homeomorphic to the topological space of symplectic leaves.*

I believe that to prove the conjecture in general one might need to understand more about the ideals themselves and this is where I hope the categorical approach might be useful.